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Comparative studies on the sex ratio of *Cyprinus carpio* var. *communis* and *Schizopyge niger* from Dal Lake, Kashmir

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Abstract

Sex ratio indicates the proportion of males and females in the population and is expected to be 1:1 in nature. In the present study, sex ratio of two commercially important fish namely *Cyprinus carpio* var. *communis* and *Schizopyge niger* has been studied for a period of one year from August 2018 to July 2019 from Dal lake, Kashmir. The study revealed that sex ratio (Male: Female) varied from 5.00:0.20 (July) to 1.14:0.83 (October) in *C. carpio*. The ratio for the entire period of study was 2.05:0.49 (Male: Female) indicating a significant dominance of males. In case of *S. niger*, sex ratio (Male: Female) varied from 0.20:5.00 in January to 0.88:1.14 in March. The sex ratio for the entire period of study was 0.48:2.07 (Male: Female) indicating a significant dominance of females.

Keywords: *Cyprinus carpio* var. *communis*, *Schizopyge niger*, Sex ratio, Dal Lake, Kashmir

1. Introduction

In fishery biological investigations on commercially important fish, detailed analysis of the sex composition in the catches is considered essential for determining whether fishing is more intense on one sex than on the other and if so, whether the observed dominance of either sex is due to shoaling behaviour or due to other causes like differential accessibility, vulnerability, growth and mortality^[1]. Sex ratio indicates the proportion of males and females in a population and is expected to be 1:1. In nature, however, variations from this are often observed and may indicate segregation or aggregation of sexes in response to feeding, breeding, migration, environmental conditions or fishing. Common carp is an ideal species for cold water of the hills and was introduced in Dal Lake of Kashmir in 1956. It has, since then, shown remarkable adaptation in various water bodies of the state and constitutes a major fishery of flat land temperate waters of Kashmir^[2]. Among schizothoracids, *Schizopyge niger* is a valuable fish of Kashmir region, but is now, in stiff competition with other exotic fishes e.g. *Cyprinus carpio*^[3]. *S. niger* locally known as Ael Gad is a prized fish of Kashmir and belongs to family Cyprinidae. It is a lacustrine fish, occurring in lakes of Kashmir in good numbers including Dal Lake. In this paper an attempt has been made to study the sex ratio of these two commercially important fish from Dal Lake, Kashmir.

2. Materials and Methods

The occurrence of number of males and females in the sampled catch was recorded for one year and the ratio of males to females occurring in the nature was calculated with respect to different months. Sex ratio indicates the proportion of male and female in the population and is expected to be 1:1 in nature. Any deviation from this ratio may indicate the dominance of one sex over the other. This happens because of differential behaviour of sexes, environmental conditions, fishing etc.^[4]. The sex ratio was tested for equality for different months using Chi-square test.

To know the homogeneity of the distribution of sex, Chi-square test^[5] was applied:

$$\chi^2 = \sum(O-E)^2/E$$

Where,

“O” is observed frequency and “E” is expected frequency.

3. Results

The sex ratio was calculated with respect to different months in *C. carpio* and *S. niger*. In case of *C. carpio*, the month-wise data on sex ratio is presented in Table 1 and Fig. 1. The sex ratio (Male: Female) varied from 5.00:0.20 in July to 1.14:0.83 in October. The chi-square (χ^2) test indicated that there was significant difference in the distribution of sexes in February, April, June, July and December in favour of males. The sex ratio for the entire period of study was 2.05:0.49

(Male: Female) indicating a significant dominance of males. In case of *S. niger*, the month-wise data on sex ratio is presented in Table 2 and Fig. 2. The sex ratio (Male: Female) varied from 0.20:5.00 in January to 0.88:1.14 in March. The chi-square (χ^2) test indicated that there was significant difference in the distribution of sexes in January, July, October, November and December in favour of females. The sex ratio for the entire period of study was 0.48:2.07 (Male: Female) indicating a significant dominance of females.

Table 1: Month-wise estimated sex ratio of *C. carpio*

Months	Total specimen	No. of males	No. of females	% of males	% of females	Expected numbers	Sex ratio	Chi square value
January	30	19	11	63.33	36.66	15	1.73:0.57	2.14
February	30	21	9	70.00	30.00	15	2.33:0.43	4.80*
March	30	20	10	66.60	33.33	15	2.00:0.5	3.32
April	30	22	8	73.33	26.66	15	2.75:0.36	6.52*
May	30	17	13	56.66	43.33	15	1.31:0.76	0.52
June	30	24	6	80.00	20.00	15	4.00:0.25	10.80*
July	30	25	5	83.33	16.66	15	5.00:0.20	13.32*
August	30	17	13	56.66	43.33	15	1.31:0.76	0.52
September	30	18	12	60.00	40.00	15	1.50:0.67	1.20
October	30	16	14	53.33	46.66	15	1.14:0.83	0.12
November	30	20	10	66.60	33.33	15	2.00:0.50	3.32
December	30	23	7	76.66	23.33	15	3.29:0.30	8.52*
Total	360	242	118	67.22	32.78	180	2.05:0.49	55.1*

* Indicates significant values

Table 2: Month-wise estimated sex ratio of *S. niger*

Months	Total specimen	No. of males	No. of females	% of males	% of females	Expected numbers	Sex ratio	Chi square value
January	30	5	25	16.66	83.33	15	0.20:5.00	13.32*
February	30	12	18	40.00	60.00	15	0.67:1.50	1.20
March	30	14	16	46.66	53.33	15	0.88:1.14	0.12
April	30	12	18	40.00	60.00	15	0.67:1.50	1.20
May	30	13	17	43.33	56.66	15	0.76:1.30	0.52
June	30	10	20	33.33	66.66	15	0.50:2.00	3.32
July	30	8	22	26.66	73.33	15	0.36:2.75	6.52*
August	30	11	19	36.66	63.33	15	0.58:1.74	2.12
September	30	10	20	33.33	66.66	15	0.50:2.00	0.02
October	30	6	24	20.00	80.00	15	0.25:4.00	10.80*
November	30	9	21	30.00	70.00	15	0.43:2.33	4.80*
December	30	7	23	23.33	76.66	15	0.30:3.28	8.56*
Total	360	117	243	32.50	67.50	180	0.48:2.07	52.50*

* Indicates significant values

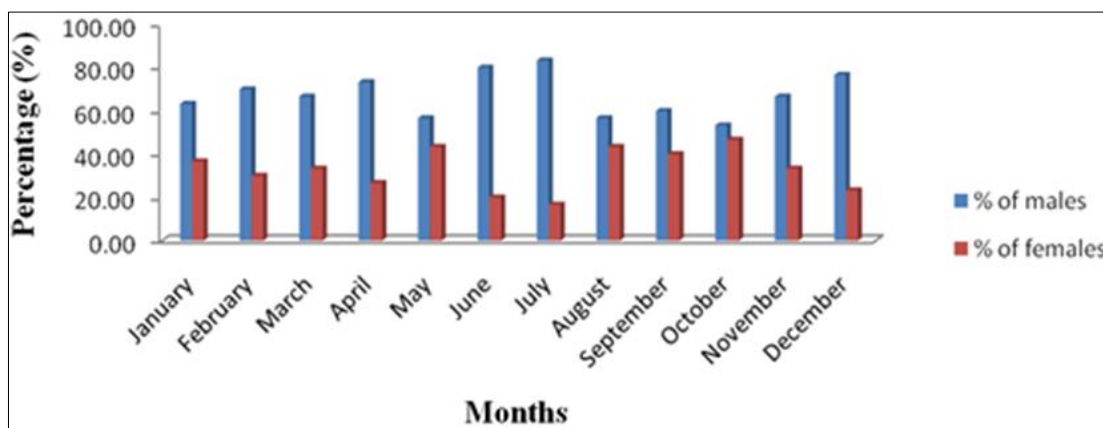


Fig 1: Month-wise percentage distribution of males and females in *C. carpio*

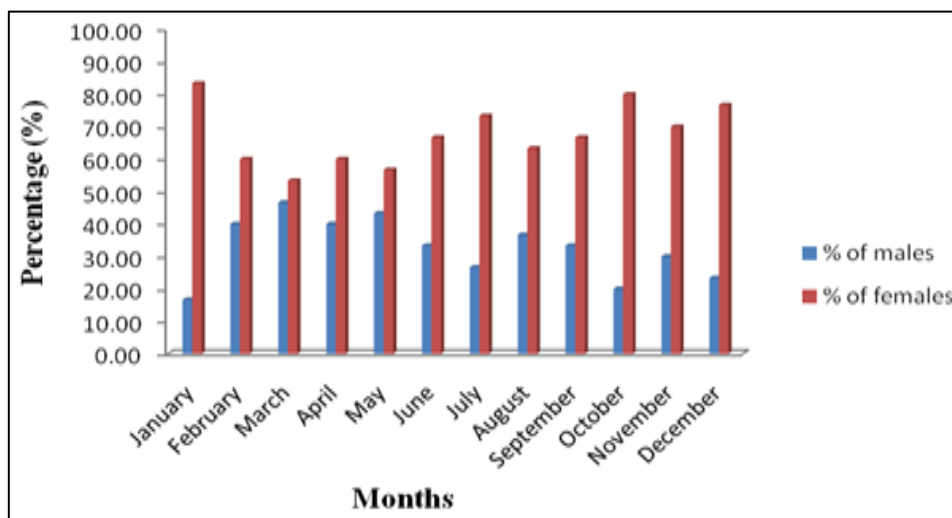


Fig 2: Month-wise percentage distribution of males and females in *S. niger*

4. Discussion

Information on sex ratio is important as it helps understanding the relationship between individuals, the environment and the state of the population [6]. Sex ratio may vary from the expected 1:1 from species to species, or even in the same population at different times, being influenced by several factors such as adaptation of the population, reproductive behavior, food availability and environmental conditions [7, 8, 9, 10, 11]. In the present study, the sex ratio was analyzed with respect to different months. The month-wise sex ratio (Male: Female) varied from 1.14:0.83 in October to 5.00:0.20 in July in *C. carpio*. The chi-square (χ^2) test indicated that there was significant dominance of males in February, April, June, July and December. The mean sex ratio for the entire period of study was estimated at 2.05:0.49 (Male: Female) indicating a significant dominance of males. Similar results have been reported by Sunder [12] in the *S. curvifrons* who reported that there were comparatively more males than females among smaller size groups (below 290mm) whereas in bigger specimens (above 290 mm), females were abundant. Qasim [13] while observing sex ratio in *C. punctata* observed males and females in the ratio of 1.00:0.82 while as Reddy [14] observed that the sex ratio differs significantly and observed that in most length groups, males outnumbered females. Qadri [15] also observed significant dominance of males in *S. curvifrons*. Dwivedi and Mayank [16] observed that sex ratio (M:F) of *Cyprinus carpio* var. *communis* of different age groups, revealed non-significant dominance of females over males (1.0:1.05). But male sex ratio was greater than female in 0 and 9+ age groups, while female sex ratio was greater than male in 1+, 2+, 3+, 4+, 5+, 6+, 8+, 10+ and 11+ age groups. Tessema *et al.* [17] while studying sex ratio in *C. carpio* observed that there were more males (596) as compared to females (459). The month wise sex ratio (Male: Female) varied from 0.88:1.14 in March to 0.20:5.00 in January in *S. niger*. The chi-square (χ^2) test indicated that there was significant dominance of females in July, October, November, December and January. The month wise sex ratio for the entire period of study was 0.48:2.07 (Male: Female) indicating a significant dominance of females. Similar results have also been found by Sunder [12] and Saba [18] which also indicated significant dominance of females in the same fish. Shafi [19] observed the sex ratio in *Carrasius carrasius* as (1:0.79) and found preponderance of females over males while as Olurin and Savage [20] have also reported same trend

in African snake head, *Parachanna obscura*, from River Oshun in which 15 were males and 60 were females, giving a sex ratio of 1:4 in the fish. Oliveira *et al.* [21] while studying sex ratio of five marine fish species observed the sex ratio of *C. chrysurus* was 2.03:1.00, *O. oglinum* was 1.41:1.00 and *L. synagris* was 4.15:1.00, where males were significantly more numerous than the females during the study period but for *H. brasiliensis* sex ratio was 0.75:1, showing a predominance of females in the population. Jega *et al.* [22] although did not reveal any significant difference in sex ratio in catfish *Hemibagrus menoda* population but a slight dominance of females over males was observed with overall sex ratio of (1.30:0.97).

5. Conclusion

From the present study it was found that the month-wise sex ratio (Male: Female) varied from 1.14:0.83 in October to 5.00:0.20 in July in *C. carpio*. The chi-square (χ^2) test indicated that there was significant dominance of males in February, April, June, July and December. In case of *S. niger*, the month wise sex ratio (Male: Female) varied from 0.88:1.14 in March to 0.20:5.00 in January. The chi-square (χ^2) test indicated that there was significant dominance of females in July, October, November, December and January.

6. References

1. Antony Raja BT. The Indian oil sardine. Bull. Cent. Mar. Fish. Res. Inst. 1969;16:128.
2. Fotedar DN, Qadri MY. Fish and fisheries and the impact of *Cyprinus Carpio* L. on endemic fish. J Sci. Univ. Kash. 1974;2:79-90.
3. Yousuf AR. Fishery resources of Kashmir. In: Ecology, Environment and Energy (Ed. A. H. Khan and A. K. Pandit) Kashmir Uni; c1996. p. 75-128.
4. Bal DV, Rao KV. Oil sardine. In: Marine fisheries of India, Tata McGraw-Hill Publishing Company Limited, New Delhi; c1984. p. 470.
5. Snedecor GW, Cochran WG. *Statistical Methods* (6th Ed.) Oxford and IBH Publishing Co., New Delhi; c1967. p. 593.
6. Vicentini RN, Araujo FG. Sex ratio and size structure of *Micropogonias furnieri* (Desmarest, 1823) (Perciformes, Sciaenidae) in Sepetiba Bay, Rio de Janeiro, Brazil. J Biol. 2003;63:559-566.
7. Nikolsky GV. The ecology of fishes. Academic Press,

- London, UK; c1963. p. 352.
8. Emlen ST, Oring LW. Ecology, sexual selection and the evolution of mating systems. *Science*. 1977;197:215-223.
 9. Baroiller JF, D'Cotta H. Environment and sex determination in farmed fish. *Comp Biochem Physiol C Toxicol Pharmacol*. 2001;130:399-409.
 10. Brykov VA, Kukhlevskii AD, Shevliakov EA, Kinas NM, Zavarina LO. Sex ratio control in pink salmon (*Oncorhynchus gorbuscha*) and chum salmon (*O. keta*) populations: the possible causes and mechanisms of changes in the sex ratio. *Genetika*. 2008;44:906-912.
 11. Vandeputte M, Quillet E, Chatain B. Are sex ratios in wild European sea bass (*Dicentrarchus labrax*) populations biased. *Aquat. Living Resour*. 2012;25:77-81.
 12. Sunder S. Maturation and spawning of *Schizothorax curvifrons* Heckel from River Jhelum, Kashmir, India. *Journal of Indian Inst. Sci*. 1984;65:41-51.
 13. Qasim SZ. Sex ratio in fish populations as a function of sexual difference in growth rate. *Current Science*. 1966;35:140-142.
 14. Reddy PB. Sex ratio of *Channa punctata* (Bloch, 1793) (Pisces, Teleostei, Channidae) from Guntur andhra Pradesh. *Proc. Indian Acad. Sci*. 1979;88(2):99-106.
 15. Qadri S. Study on growth and reproductive biology of *Schizothorax curvifrons* (Heckel) in River Jhelum, Kashmir. M. F. Sc thesis. Faculty of Fisheries, Rangil, SKUAST-Kashmir; c2015.
 16. Dwivedi AC, Mayank P. Studies on the age, growth pattern and sex ratio of *Cyprinus carpio* var. *communis* from the largest tributary of the Ganga river, India. *Journal of the Kalash Science*. 2013;2(3):21-27.
 17. Tessema A, Getahun A, Mengistou S, Fetahi T, Dejen E. Reproductive biology of common carp (*Cyprinus carpio* Linnaeus, 1758) in Lake Hayq, Ethiopia. *Fisheries and Aquatic Sciences*. 2020;23(16):1-10.
 18. Saba K. Biology and population dynamics of Snow trout *Schizopyge niger* in Nigeen Lake, Kashmir. Ph. D. Thesis. Faculty of Fisheries, Rangil, SKUAST-K; c2016.
 19. Shafi S. Study on fecundity and GSI of *Carassius carassius* (Linnaeus, 1758) from Dal Lake Kashmir. *Journal of Biology, Agriculture and Healthcare*. 2012;2(3):68-75.
 20. Olurin KB, Savage OD. Reproductive biology, length-weight relationship and condition factor of the African snake head, *Parachanna obscura*, from River Oshun, South-west Nigeria. *International Journal of Fisheries and Aquaculture*. 2011;3(8):146-150.
 21. Oliveira MR, Costa EFS, Araujo AS, Pessoa EKR, Carvalho MM, Cavalcante LFM, *et al*. Sex ratio and length-weight relationship for five marine fish species from Brazil. *J Mar. Biol. Oceanogr*. 2012;1:2.
 22. Jega IS, Miah MI, Haque MM, Shahjahan M, Ahmed ZF, Fatema MK. Sex ratio, length-weight relationships and seasonal variations in condition factor of menoda catfish *Hemibagrus menoda* (Hamilton, 1822) of the Kangsha River in Bangladesh. *International Journal of Fisheries and Aquatic Studies*. 2017;5(5):49-54.